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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/694,889	10/29/2003	Motoji Yagura	0020-5187P	4112
2292	7590	12/20/2004	EXAMINER	
BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747			TRAN, MAI HUONG C	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 12/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/694,889

Applicant(s)

YAGURA, MOTOJI

Examiner

Mai-Huong Tran

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 and 16 is/are rejected.
- 7) ☒ Claim(s) 14 and 15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10/29/03 & 1/29/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 U.S.C. § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-13 and 16 are rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,348,704 to Teraguchi in view of U.S. Patent No. 6,482,711 to Nguyen et al. (herein after Nguyen).

Regarding to claim 1, Teraguchi discloses a heterojunction bipolar transistor comprising a collector layer 64, a base layer 65 and an emitter layer 66, wherein the collector layer, the base layer and the emitter layer have different lattice constants of a_c , a_b , a_e (col. 8, lines 41-45) respectively, and a value of a_b equals to 2.97 Angstroms, a_c equals to 3.13 Angstroms and a_e is close to a_b . However, Teraguchi does not expressly teaches the value of a_b is between values of a_c and a_e .

Nguyen also does not teach the value of a_b is between values of a_c and a_e , but Nguyen teaches "By changing the corresponding compositions of the emitter, base, and

collector slightly HBTs can be realized which are lattice matched to GaSb where the same ideas and advantages will apply.” (col. 2, lines 46-50).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Teraguchi with the teaching of Nguyen to obtain the value of a_b between the values of a_c and a_e in order to have superior transport properties that result in BJTs with very high speed and to provide opportunities for greatly reduced power consumption (Nguyen - col. 2, lines 1-4).

Regarding to claim 2, Teraguchi in view of Nguyen discloses the heterojunction bipolar transistor wherein the values of a_c , a_b , a_e satisfy a relationship of $a_c > a_b > a_e$ (Teraguchi – column 8, lines 41-45, Nguyen - column 2, lines 33-50).

Regarding to claim 3, Nguyen discloses the heterojunction bipolar transistor wherein the values of a_c , a_b , a_e satisfy a relationship of $a_c < a_b < a_e$ (column 2, lines 33-50).

Regarding to claim 4, Nguyen discloses the heterojunction bipolar transistor wherein the heterojunction bipolar transistor is of an emitter-up type, and the values of a_c and a_b satisfy a relationship of $|a_e - a_b| / a_b \times 100 \leq 0.3$ (%) (column 2, lines 33-50).

Regarding to claim 5, Nguyen discloses the heterojunction bipolar transistor wherein the heterojunction bipolar transistor is of an emitter-up type, and the values of a_e and a_b satisfy a relationship of $|a_e - a_b| / a_b \times 100 \leq 0.1$ (%) (column 2, lines 33-50).

Regarding to claim 6, Nguyen discloses the heterojunction bipolar transistor wherein the heterojunction bipolar transistor is of an emitter-up type, and the values of a_b and a_c satisfy a relationship of $|a_b - a_c| / a_c \times 100 \leq 0.3$ (%) (column 2, lines 33-50).

Regarding to claim 7, Nguyen discloses the heterojunction bipolar transistor wherein the heterojunction bipolar transistor is of an emitter-up type, and the values of a_b and a_c satisfy a relationship of $|a_b - a_c| / a_c \times 100 \leq 0.1$ (%) (column 2, lines 33-50).

Regarding to claim 8, Nguyen discloses the heterojunction bipolar transistor wherein the heterojunction bipolar transistor is of a collector-up type, and the values of a_c and a_b satisfy a relationship of $|a_c - a_b| / a_b \times 100 \leq 0.3$ (%) (column 2, lines 33-50).

Regarding to claim 9, Nguyen discloses the heterojunction bipolar transistor wherein the heterojunction bipolar transistor is of a collector-up type, and the values of a_c and a_b satisfy a relationship of $|a_c - a_b| / a_b \times 100 \leq 0.1$ (%) (column 2, lines 33-50).

Regarding to claim 10, Nguyen discloses the heterojunction bipolar transistor wherein the heterojunction bipolar transistor is of a collector-up type, and the values of a_b and a_e satisfy a relationship of $|a_b - a_e| / a_e \times 100 \leq 0.3$ (%) (column 2, lines 33-50).

Regarding to claim 11, Nguyen discloses the heterojunction bipolar transistor wherein the heterojunction bipolar transistor is of a collector-up type, and the values of a_b and a_e satisfy a relationship of $|a_b - a_e| / a_e \times 100 \leq 0.1$ (%) (column 2, lines 33-50).

Regarding to claim 16, the heterojunction bipolar transistor of Nguyen is obviously included the junction temperature at 300°K (column 4, table I).

Claims 12-13 are rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 6,348,704 to Teraguchi in view of U.S. Patent No. 6,482,711 to Nguyen et al. and further in view of Takahashi et al. (U.S. Patent No. 5,682,046).

Regarding to claim 12, Teraguchi in view of Nguyen teaches the claimed invention except for the heterojunction bipolar transistor wherein an InGaP/GaAs heterojunction is applied. Takahashi teaches the heterojunction bipolar transistor wherein an InGaP/GaAs heterojunction is applied as set forth in column 6, lines 10-12.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the heterojunction bipolar transistor wherein an InGaP/GaAs heterojunction is applied, as taught by Takahashi in order to provide an HBT having good high frequency characteristics capable of forming a base region having a high impurity concentration without lowering a current gain and capable of preventing a time-dependent leak current increase between the base and emitter regions, thereby improving the high frequency characteristics, improving the reliability and the current gain (col. 2, lines 59-64, col. 3, lines 26, 30, and 41).

Regarding to claim 13, Teraguchi in view of Nguyen discloses the claimed invention except for the heterojunction bipolar transistor wherein an InP/InGaAs heterojunction is applied. Takahashi teaches the heterojunction bipolar transistor wherein an InP/InGaAs heterojunction is applied as set forth in column 6, lines 10-12.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the heterojunction bipolar transistor wherein an InP/InGaAs heterojunction is applied, as taught by Takahashi in order to provide an HBT having good high frequency characteristics capable of forming a base region having a high impurity concentration without lowering a current gain and capable of preventing a time-dependent leak current increase between the base and emitter regions, thereby improving the high frequency characteristics, improving the reliability and the current gain (col. 2, lines 59-64, col. 3, lines 26, 30, and 41).

Allowable Subject Matter

Claims 14 and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, since the prior made of record and considered pertinent to the applicant's disclosure does not teach or suggest the claimed limitations. Takahashi et al. (5,682,046) and Nguyen et al. (6,482,711) taken individually or in combination, do not teach the claimed invention the heterojunction bipolar transistor wherein the emitter layer comprises a first emitter layer and a second emitter layer, the first emitter layer is sandwiched between the base layer and the second emitter layer, the first and second emitter layers have lattice constants of a_{e1} and a_{e2} respectively, a value of a_{e2} corresponds to the value of a_e , and the values of a_{e2} and a_b satisfy a relationship of $|a_{e2} - a_b| / a_b \times 100 > 0.3 (\%)$, and wherein the collector layer comprises a first collector layer and a second collector layer, the first collector layer is sandwiched between the base layer and the second collector layer, the first and second collector layers have lattice constants of a_{c1} and a_{c2} respectively, a value of a_{c2} corresponds to the value of a_c , and the values of a_{c2} and a_b satisfy a relationship of $|a_{c2} - a_b| / a_b \times 100 > 0.3 (\%)$.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mai-Huong Tran whose telephone number is (571)272-1796. The examiner can normally be reached on 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571)272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Mai-Huong Tran
Examiner
Art Unit 2818